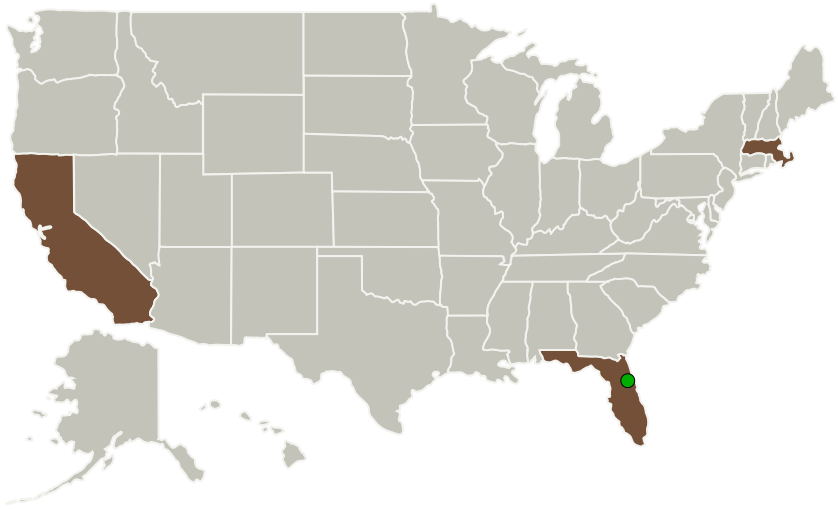
Terahertz Quantum Cascade Laser Based 3D Imaging, Phase II

Completed Technology Project (2011 - 2014)

Project Introduction

LongWave Photonics proposes a terahertz quantum-cascade laser based swept-source optical coherence tomography (THz SS-OCT) system for single-sided, 3D, nondestructive evaluation (NDE) of non-conductive materials. The THz SS-OCT system uses a frequency tunable QCL array to generate an interferometric signal between a reference mirror, and a sample. An algorithm is used to transform this signal into depth information of the interfaces within the sample. Phase I demonstrated the feasibility of measuring the interfaces of a dielectric on metal sample. In Phase II, we propose to demonstrate a complete scanning system for 3D imaging by upgrading the optics and mechanics. Improvements in the power levels and frequency bandwidth of the QCL source are expected to greatly improve the depth resolution and signal to noise ratio of the system. The milliwatt power levels of the QCL are expected to result in fast scan speeds. Operation of the SS-OCT system is expected to be relatively simple as the QCL is an electrically pumped, solid state source of terahertz radiation, capable of operation in a compact, high reliability crycooler as demonstrated in Phase I.

Primary U.S. Work Locations and Key Partners



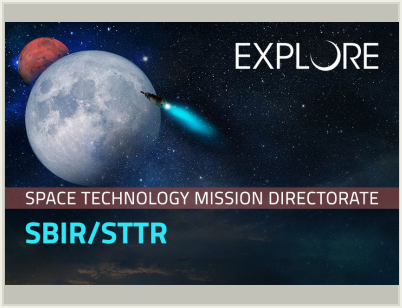


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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
LongWave Photonics, LLC	Lead Organization	Industry	Mountain View, California
Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida
Massachusetts Institute of Technology(MIT)	Supporting Organization	Academia	Cambridge, Massachusetts

Primary U.S. Work Locations	
California	Florida
Massachusetts	

Project Transitions

June 2011: Project Start

June 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140659)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

LongWave Photonics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

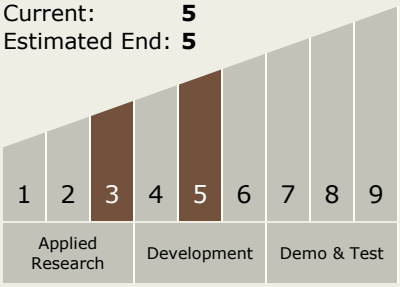
Carlos Torrez

Principal Investigator:

Alan W Lee

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System